Relative Solvency and Bank Stability: Assessing the Financial Health of selected Deposit Money Banks in Nigeria (2017-2021)

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ABSTRACT

The persistent challenge of maintaining bank solvency and financial stability has intensified following successive global financial crises and the implementation of Basel III regulatory reforms. Although several financial distress prediction models have been developed, their suitability for evaluating banking institutions remains uncertain because most were originally designed for non-financial firms. This study evaluates the effectiveness of a modified Enyi's Relative Solvency Ratio (RSR) alongside four widely used discriminant models—Altman's Z-score, Springate's Z-score, Taffler's Z-score, and Zmijewski's Z-score—in assessing the financial health and stability of selected Nigerian Deposit Money Banks. An ex-post facto research design was adopted using panel data obtained from the published financial statements of thirteen Deposit Money Banks covering the period 2017–2021. The computed solvency measures were analysed using fixed-effects and random-effects panel regression models, with the Hausman specification test guiding model selection and Driscoll-Kraay robust standard errors correcting for serial correlation and heteroskedasticity. The findings reveal that the Relative Solvency Ratio is a positive and statistically significant predictor of banks' working capital requirement, serving as a proxy for capital adequacy and financial resilience. Among the conventional distress prediction models, only Taffler's Z-score demonstrated significant explanatory power after robustness corrections, whereas Altman's, Springate's, and Zmijewski's models were statistically insignificant. The results suggest that banking-specific operational liquidity measures provide more reliable assessments of bank stability than traditional corporate bankruptcy prediction models. The study contributes to the banking stability literature by validating the Relative Solvency Ratio as a practical early-warning indicator of financial resilience and recommends its integration into prudential supervision and internal risk management frameworks to complement existing Basel III solvency and liquidity indicators.

Keywords: Bank stability; Relative Solvency Ratio (RSR); financial health; solvency; Deposit Money Banks; panel data regression; Basel III; Nigeria.

INTRODUCTION

Since 1990, the problem of bank stability and solvency has evolved from isolated institutional failures into a major issue of global financial stability. International experience demonstrates that inadequate capitalization, weak governance, excessive risk-taking, poor asset quality, and ineffective regulation remain the principal determinants of banking crises. In Africa, structural weaknesses, macroeconomic instability, and institutional deficiencies have compounded these problems, while Nigeria has experienced repeated episodes of banking distress followed by comprehensive regulatory reforms. Although significant progress has been achieved through

Basel standards, macroprudential regulation, banking consolidation, and stronger supervision, maintaining bank stability remains an ongoing challenge (Mlachila, et al. 2013; Simpasa, et al. 2011; Dafe, 2020).

As a matter of painful reality, bank stability and solvency have become central concerns in financial economics, banking regulation, and macroeconomic policy. The increasing integration of global financial markets, financial liberalization, rapid technological innovation, expansion of cross-border banking, and repeated episodes of financial crises have transformed banking from a relatively protected industry into one characterized by greater opportunities but also greater systemic risks. While banks perform the indispensable functions of financial intermediation, payment facilitation, liquidity transformation, and credit creation, their highly leveraged nature makes them inherently vulnerable to instability. Consequently, the ability of banks to remain solvent and financially stable has attracted sustained attention from regulators, researchers, and international institutions such as the Bank for International Settlements, the International Monetary Fund and World Bank (Cole & Gunther, 1998; Demirgüç-Kunt & Detragiache, 1998; Caprio & Klungebiel, 2003).

Bank stability generally refers to the ability of banks and the banking system to continue performing their financial intermediation functions without experiencing distress that threatens the wider financial system. Solvency, on the other hand, refers to the ability of a bank's liquid assets to exceed its liabilities such that it possesses adequate capital to absorb unexpected losses while remaining operational. Although liquidity and solvency are conceptually different, persistent liquidity problems frequently evolve into solvency crises, while insolvent banks almost invariably experience liquidity shortages. Recent historical evidence continues to show that deteriorating asset quality and capital erosion remain the principal causes of bank failures, while depositor runs typically accelerate rather than initiate failures (Correia, et al. 2025; Correia, et al. 2026; Mlachila, et al. 2013).

From the global perspective, the post-1990 period can be divided into several distinct phases of banking stability challenges. The early 1990s witnessed banking crises across developed and developing economies following financial deregulation during the 1980s. Liberalization encouraged competition and innovation but also increased excessive lending, speculative investments, and inadequate risk management. Banking crises I in the Nordic countries, Japan, Mexico, several Latin American economies, and many emerging markets (Reinhart & Rogoff, 2009).

Japan experienced perhaps the longest banking crisis following the collapse of its asset price bubble in the early 1990s. Falling real estate prices severely impaired bank balance sheets, leading to decades of weak profitability and prolonged economic stagnation.

The Asian Financial Crisis of 1997–1998 demonstrated how weaknesses in banking supervision, excessive foreign currency borrowing, and poor corporate governance could rapidly undermine banking solvency across countries including Thailand, Indonesia, South Korea, and Malaysia (Laeven & Valencia, 2020).

The most significant global banking crisis occurred during the Global Financial Crisis of 2007–2009. Excessive exposure to subprime mortgage securities, high leverage, weak underwriting standards, inadequate capital buffers, and interconnected financial markets resulted in the collapse or rescue of several major international banks. Governments worldwide injected trillions of dollars into banking systems while central banks implemented extraordinary monetary policies to restore confidence.

The crisis fundamentally changed international banking regulation. The Basel III Accord introduced stricter capital adequacy requirements, leverage ratios, liquidity coverage ratios (LCR), net stable funding ratios (NSFR), and macroprudential supervision designed to enhance banking resilience against future shocks.

Even after Basel III, new challenges have continued to emerge, including cyber risks, climate-related financial risks, digital banking competition, fintech disruption, cryptocurrency exposures, geopolitical conflicts, inflation shocks following the COVID-19 pandemic, and rising interest rate risks. The 2023 failures of several regional banks in the United States again highlighted how rapid increases in interest rates can generate unrealized losses sufficient to undermine depositor confidence despite regulatory improvements.

Across the global banking industry, the principal causes of instability since 1990 include: weak capitalization, high non-performing loans, poor credit risk management, excessive leverage, liquidity shortages, corporate governance failures, regulatory arbitrage, moral hazard associated with "too-big-to-fail" institutions, contagion arising from financial interconnectedness, and macroeconomic shocks (Allen & Gale, 2007; Brownbridge, 1998; Caprio & Klungebiel, 2003; Demirgüç-Kunt & Detragiache, 1998).

Consequently, modern banking supervision has increasingly shifted from institution-specific regulation toward macroprudential oversight emphasizing systemic resilience.

From the African perspective, regional banking systems have experienced similar stability challenges although the causes have differed somewhat from those of developed economies.

During the 1990s, many African countries embarked upon structural adjustment programmes involving financial liberalization, privatization, exchange rate reforms, and deregulation. While these reforms improved financial development, they also exposed weaknesses in bank governance and supervisory capacity.

Several African banking systems experienced widespread insolvency due to - politically directed lending, weak loan recovery, inadequate capitalization, poor accounting standards, government interference, macroeconomic instability, foreign exchange volatility, and weak institutional quality (Mlachila, et al. 2013).

An IMF review documented severe banking crises across numerous Sub-Saharan African countries during the late 1980s and 1990s, including Kenya, Tanzania, Uganda, Nigeria, Senegal, and others, with insolvency affecting substantial proportions of banking assets (Le Gall, et al. 2004).

Following the Global Financial Crisis, African banks generally demonstrated greater resilience than many Western institutions because of their relatively limited exposure to complex securitized assets. Nevertheless, indirect effects through declining commodity prices, reduced capital inflows, and slower economic growth weakened bank profitability and asset quality (Cook, 2016).

More recently, African banking systems have been affected by - sovereign debt exposures, exchange rate depreciation, inflation, climate risks, political instability, cybersecurity threats, increasing digital financial services, and the expansion of pan-African banking groups.

Empirical evidence suggests that banking stability in Africa is significantly influenced by banking efficiency, political stability, regulatory quality, investor protection, banking concentration, institutional effectiveness, and macroeconomic conditions (Ozili, 2018).

Despite regulatory improvements, many African banking systems continue to struggle with high levels of non-performing loans, limited financial inclusion, concentration risks, and relatively shallow capital markets (Allen, et al. 2011).

Nigeria presents one of Africa's most extensively documented cases of recurring banking instability.

Although banking reforms began with the Structural Adjustment Programme introduced in 1986, the most severe banking distress emerged during the early 1990s. Financial liberalization increased competition and encouraged rapid entry of new banks, many of which possessed inadequate managerial competence and weak capital bases. Regulatory capacity failed to keep pace with industry expansion. By the early 1990s, numerous Nigerian banks had become technically insolvent due to insider lending, fraudulent practices, weak corporate governance, inadequate capitalization, poor credit appraisal, political interference, foreign exchange speculation, poor internal controls, and ineffective supervision (Ojo, 1991).

Historical evidence indicates that between 1991 and 1995, numerous Nigerian banks became insolvent while non-performing loans reached extremely high levels (Dafe, 2020; Alley, 2023; IMF, 2013).

The banking crisis culminated in repeated regulatory interventions throughout the 1990s.

Recognizing the fragility of the banking system, the Central Bank of Nigeria introduced several prudential reforms including minimum capital adequacy requirements, loan classification standards, provisioning guidelines, and intensified supervision (Ojo, 1991; Ibeabuchi, 2008).

The landmark banking consolidation programme introduced in 2004 under Governor Charles Chukwuma Soludo increased minimum shareholders' funds from ₦2 billion to ₦25 billion. Through mergers and acquisitions, the number of commercial banks declined from 89 to 25 (later 24), substantially strengthening industry capitalization (Dafe, 2020; Cook, 2016; Ibeabuchi, 2008).

However, consolidation alone did not eliminate banking fragility. The global financial crisis exposed weaknesses arising from excessive margin lending, oil sector exposures, poor governance, and weak risk management. In 2009, the CBN intervened in several distressed banks, removed management teams, injected liquidity support, and subsequently established the Asset Management Corporation of Nigeria to purchase non-performing loans (Ojo, 2016).

Subsequent reforms included - Basel II and Basel III implementation, adoption of IFRS, stronger corporate governance codes, risk-based supervision, stress testing, enhanced disclosure requirements, establishment of macroprudential surveillance, and enactment of the Banking and Other Financial Institutions Act (BOFIA) 2020 to strengthen regulatory powers (Alley, 2023; Dafe, 2020).

Despite these improvements, Nigerian banks continue to face important solvency and stability challenges from exchange rate volatility, inflation, sovereign debt concentration, oil price dependence, cybersecurity risks, climate-related risks, digital banking fraud, liquidity pressures, concentration of credit exposures, macroeconomic instability, and persistent non-performing loans in some sectors.

Nevertheless, the Nigerian banking industry today is considerably more resilient than during the 1990s because of stronger capital regulation, improved supervisory frameworks, enhanced risk management practices, and better corporate governance. But the greatest challenge facing the Nigerian bank sector remains woven around the issues of liquidity and stability of operations.

The questions to be addressed in this research on the basis of the foregoing are:

i) How can the solvency and stability issue in the Nigerian banking sector be addressed?
ii) How effective are the currently available solvency and stability measurement tools in identifying problem spots in the Nigerian banking sector?

LITERATURE REVIEW

The banking industry occupies a central position in every modern economy because it performs the critical functions of financial intermediation, payment facilitation, liquidity creation, and monetary policy transmission. The stability of banking institutions therefore has significant implications not only for shareholders and depositors but also for governments, businesses, and the broader economy. Episodes such as the Nordic banking crises of the early 1990s, the Asian Financial Crisis of 1997–1998, the Global Financial Crisis of 2007–2009, the European sovereign debt crisis, and more recent banking failures have demonstrated that weaknesses in bank solvency and financial health can rapidly evolve into systemic financial instability (Demirgüç-Kunt & Detragiache, 1998; Reinhart & Rogoff, 2009).

Consequently, banking regulators, investors, researchers, and policymakers increasingly focus on three closely related but conceptually distinct constructs: solvency, financial stability, and financial health. Although these concepts are often used interchangeably, each captures a different dimension of a bank's ability to survive, withstand shocks, and continue performing its economic functions. Understanding their interrelationships is therefore fundamental to banking supervision, risk management, investment analysis, and financial sector policy.

Concept of Bank Solvency

Solvency refers to the long-term financial capacity of a bank to meet all its financial obligations as they become due while maintaining sufficient capital to absorb unexpected losses. A solvent bank possesses assets whose value exceeds its liabilities, thereby maintaining positive net worth even under adverse economic conditions (Basel Committee on Banking Supervision [BCBS], 2011).

Unlike liquidity, which concerns the availability of cash to meet short-term obligations, solvency concerns the overall financial viability of the institution. A bank may remain liquid for some time despite being technically insolvent, especially if supported by central bank funding or government guarantees. Conversely, a fundamentally solvent bank may temporarily experience liquidity shortages due to market disruptions.

Bank solvency primarily depends upon capital adequacy, asset quality, profitability, credit risk management, earnings retention, market valuation of assets, and overall risk exposure.

The Basel III regulatory framework significantly strengthened solvency standards by increasing minimum capital requirements, introducing capital conservation buffers, countercyclical capital buffers, leverage ratios, and stricter definitions of regulatory capital (BCBS, 2017). These reforms seek to ensure that banks maintain sufficient loss-absorbing capacity throughout the business cycle.

Financial Stability of Banking Institutions

Financial stability refers to the ability of individual banks and the banking system as a whole to withstand economic shocks, maintain confidence, continue providing essential financial services, and avoid disruptions that could threaten economic growth (Schinasi, 2004).

Financial stability extends beyond the solvency of individual institutions. A banking system may consist largely of solvent banks while still experiencing systemic instability arising from contagion, liquidity shortages, interbank market failures, or widespread loss of public confidence.

The International Monetary Fund defines financial stability as the condition in which the financial system efficiently allocates resources, manages risks, absorbs shocks, and supports sustainable economic activity without major disruption (IMF, 2019).

The major dimensions of financial stability include: Capital resilience, Liquidity resilience, Operational resilience, Risk management effectiveness, Market confidence, Payment system continuity, Systemic interconnectedness, and Regulatory compliance.

Financial stability therefore represents both microprudential stability at the institutional level and macroprudential stability across the entire financial system.

Financial Health of Banking Institutions

Financial health is a broader concept that reflects the overall financial strength, operating efficiency, profitability, sustainability, and resilience of a banking institution. It integrates multiple dimensions of performance into a comprehensive assessment of organizational well-being.

A financially healthy bank typically demonstrates strong profitability, adequate capitalization, high asset quality, stable earnings, efficient cost management, sufficient liquidity, sustainable growth, and effective governance.

Financial health is therefore multidimensional, encompassing not only the absence of financial distress but also the institution's capacity to create long-term shareholder value while protecting depositors and maintaining public confidence.

Researchers commonly assess financial health using composite indicators such as the CAMELS framework, Altman's Z-score adaptations for financial institutions, the Bankometer model, distance-to-default measures, and various solvency indices (Cole & Gunther, 1998; IMF, 2019).

Relationship between Solvency, Financial Stability and Financial Health

Although closely related, solvency, financial stability, and financial health differ in scope and emphasis.

Solvency represents the foundation of financial health. Without adequate solvency, a bank cannot remain financially healthy over the long term. Financial health, however, encompasses additional dimensions such as profitability, efficiency, governance, and sustainability. Financial stability extends further by considering both institutional resilience and the stability of the wider financial system.

The relationship may therefore be viewed hierarchically in the context that solvency provides the financial foundation, financial health reflects overall institutional performance while financial stability reflects the resilience of both individual institutions and the banking system.

Strong solvency contributes to financial health, while financially healthy banks collectively enhance financial system stability. Conversely, deteriorating financial health often weakens solvency, which may ultimately threaten systemic stability.

Indicators of Bank Solvency and Financial Health

Several financial indicators are widely employed to evaluate bank solvency and financial health. These include Capital Adequacy Ratio (CAR), Leverage Ratio (LR), Relative Solvency Ratio (RSR), Return On Assets (ROA), Return On Equity (ROE), Net Interest Margin (NIM), Non Performing Loans (NPL) ratio, Liquidity Coverage Ratio (LCR), and Net Stable Funding Ratio (NSFR).

CAR measures regulatory capital relative to risk-weighted assets and remains the principal indicator of solvency; LR evaluates capital relative to total exposure without risk weighting; RSR compares available liquidity volume with the required liquidity volume when used as short-term stability measure; but compares shareholders' funds with total liabilities or related balance sheet obligations when long-term stability is considered. It provides a simplified measure of the extent to which owners' equity supports creditors' funds and reflects the institution's relative solvency position. ROA measures management's efficiency in generating earnings from total assets, while ROE evaluates profitability from shareholders' investment.

NIM measures earnings generated from interest-bearing assets; NPL ratio indicates credit risk and asset quality; LCR evaluates the ability to withstand short-term liquidity stress, while NSFR measures long-term funding stability.

Together, these indicators provide complementary evidence regarding the overall financial condition of banking institutions.

Determinants of Bank Solvency

Numerous internal and external factors influence bank solvency, specifically, internal determinants include: capital management, credit risk management, loan portfolio quality, operational efficiency, corporate governance, profitability, earnings retention, and risk management practices. While the external determinants can include macroeconomic conditions, inflation, interest rate volatility, exchange rate fluctuations, regulatory policies, political stability, financial market conditions, and technological disruption.

Research consistently demonstrates that deteriorating asset quality, excessive leverage, weak governance, and poor risk management significantly increase insolvency risk (Laeven & Valencia, 2020).

Regulatory Framework for Bank Solvency

Following the Global Financial Crisis, banking regulation shifted toward strengthening bank resilience through higher capital standards.

Basel III introduced - Higher minimum Common Equity Tier 1 capital, Capital Conservation Buffer, Countercyclical Capital Buffer, Leverage Ratio, Liquidity Coverage Ratio, Net Stable Funding Ratio, and Enhanced supervisory review.

These reforms aim to reduce the probability of bank failures while increasing the banking sector's ability to absorb severe economic shocks.

National regulators, including the Central Bank of Nigeria (CBN), have incorporated Basel standards into prudential regulations governing capital adequacy, liquidity management, risk governance, and stress testing.

Solvency and Banking Crisis Prevention

Historical banking crises consistently demonstrate that declining solvency is often an early warning indicator of financial distress. Banks experiencing sustained capital erosion become increasingly vulnerable to liquidity shortages, depositor withdrawals, declining market confidence, and eventual failure.

Consequently, modern banking supervision increasingly emphasizes early warning systems incorporating solvency ratios, stress testing, capital planning, and continuous financial health monitoring. Early intervention enables supervisory authorities to implement corrective measures before solvency problems become systemic.

Furthermore, continuous monitoring of solvency complements traditional periodic financial reporting by providing timely information regarding changes in institutional resilience.

As an innovative introduction into the context of banking, this study defines relative solvency as the volume of liquidity available to a bank relative to its required volume of liquidity as dictated by its size and complexity of operations. This aligns with the relative solvency and operational break even theory proposed in Enyi (2008) and further exemplified in Enyi (2021).

A bank's required volume of liquidity is a function of its operational break-even point, which is a point of operation where its competencies are at equilibrium with the operating costs, and its ability to lend and maintain adequate responsiveness to depositors, financial, and economic regulators. A bank's operational break-even point is expected to align dynamically with its volume of activities in terms of deposit taking, capacity to lend, and risk management.

The operational break-even point for a bank is derived from, 1) the capacity of the bank to earn in the form of the markup ratio achieved on every naira committed to its activities. Naturally, this emanates from the interplay between the turnover achieved and the attendant operating costs used to achieve that turnover; 2) the bank's operational break-even point, which is stated in circles of activities and used to measure the working capital or liquidity volume required to attain the bank's homeostatic capacity; 3) the available liquidity volume is then applied as a comparator to the established homeostatic liquidity volume to obtain the relative solvency ratio, which on its own indicates how prepared the liquid resources available to the bank is to weather the storm of depositors' and other current liabilities' demand.

From the foregoing, this study considers the working capital required at a bank's operational break-even point as a good measure of a bank's capital adequacy and its consequent stability value.

Theoretical Framework

This study is anchored on four complementary theories—Capital Buffer Theory, Financial Intermediation Theory, Agency Theory, and Banking Firm Theory—to explain the relationship between relative solvency and bank stability.

The Capital Buffer Theory posits that banks maintain capital in excess of regulatory minimum requirements as a buffer against unexpected losses and financial distress (Milne & Whalley, 2001). A larger capital buffer enhances a bank's ability to absorb adverse shocks, maintain depositor confidence, and continue lending during periods of economic uncertainty. Consequently, banks with stronger relative solvency are expected to exhibit greater financial resilience and stability because they possess sufficient capital to withstand fluctuations in credit, market, and operational risks.

The Financial Intermediation Theory views banks as specialized institutions that mobilize savings from surplus units and allocate them efficiently to deficit units, thereby reducing information asymmetry, transaction costs, and liquidity risks (Diamond, 1984). Effective financial intermediation depends on the solvency and credibility of banking institutions. Banks with stronger solvency positions are better able to perform their intermediation functions, preserve public confidence, and sustain financial system stability. Conversely, weak solvency undermines lending capacity and increases systemic vulnerability.

The Agency Theory, developed by Jensen and Meckling (1976), explains the conflicts of interest among shareholders, managers, depositors, and regulators arising from the separation of ownership and control. Bank managers may undertake excessive risk-taking or inefficient investment decisions that erode capital and threaten solvency unless appropriate governance mechanisms are in place. Strong solvency therefore reflects prudent managerial decisions, effective corporate governance, and sound risk management practices, all of which contribute positively to bank stability.

The Banking Firm Theory conceptualizes banks as profit-maximizing firms that transform liabilities into earning assets while balancing profitability, liquidity, and risk (Klein, 1971; Monti, 1972). The theory emphasizes that the financial health and long-term survival of a banking firm depend on maintaining an optimal capital structure and adequate solvency. A relatively solvent bank is better positioned to absorb unexpected losses, sustain profitable operations, and remain stable under changing macroeconomic and competitive conditions.

Collectively, these theories provide a robust theoretical foundation for examining the relationship between relative solvency and bank stability. While Capital Buffer Theory emphasizes the protective role of excess capital – the main crux of RSR measurement, Financial Intermediation Theory highlights the importance of solvency in sustaining banking functions. Agency Theory explains the governance mechanisms influencing solvency, whereas Banking Firm Theory underscores the strategic management of capital, assets, and liabilities to ensure long-term financial stability. Together, they support the proposition that stronger relative solvency enhances the financial health, resilience, and stability of banking institutions.

Empirical Framework

Recent empirical studies consistently show that stronger solvency and capital positions improve bank stability, although the magnitude of the relationship varies across institutional and macroeconomic environments.

Using a panel of eight listed Nigerian Deposit Money Banks from 2010 to 2022, Onyenagubom and Nongu (2024) employed a Panel Autoregressive Distributed Lag (PARDL) model to examine the effect of capital adequacy on bank stability. Bank stability was measured using the Z-score, while explanatory variables included bank capital-to-total-credit ratio, loan-to-deposit ratio, debt-to-equity ratio, and risk-weighted assets. The study found that bank capital-to-total-credit ratio and risk-weighted assets exerted a significant positive effect on bank stability, whereas loan-to-deposit and debt-to-equity ratios had significant negative effects, concluding that stronger capitalization enhances banking sector stability.

In a broader cross-country analysis covering 102 commercial banks from 14 developing economies between 2016 and 2024, Msigwa, Gabriel, and Kohi (2025) adopted a two-step System Generalized Method of Moments (System-GMM) estimator. Bank stability was proxied by the Z-score, while capital adequacy was measured using Common Equity Tier 1 (CET1), Total Capital Ratio, and Leverage Ratio. The results showed that all three capital measures significantly improved bank stability, with CET1 exhibiting the strongest stabilizing effect, while non-performing loans reduced stability.

Examining the Nigerian banking industry, Aniemeke (2024) employed Ordinary Least Squares (OLS) time-series regression using data from 2000 to 2021. The study measured bank stability using the Z-score and assessed the influence of regulatory capital ratio, non-performing loans, cost-to-income ratio, loan-to-deposit ratio, and bank concentration. The findings identified regulatory capital and asset-quality indicators as significant determinants of bank stability, emphasizing the importance of maintaining adequate solvency and prudent risk management.

Focusing on Islamic commercial banks in Indonesia, Sugestin and Khoiruddin (2025) utilized panel data regression based on quarterly observations from 2021 to 2024. Financial stability was measured using the Z-score, while capital adequacy, liquidity, and profitability served as explanatory variables. The results indicated that capital adequacy and profitability positively influenced financial stability, confirming that well-capitalized banks are more resilient to financial shocks.

Finally, Mustafa (2024) investigated the combined influence of digital payment systems and capital adequacy on bank stability in Jordan using panel econometric analysis over the period 2004–2022. Bank stability was measured by the Z-score, while capital adequacy ratio was included as a key explanatory variable. The study reported that stronger capital adequacy significantly enhanced bank stability in both the short and long run, even amid increased operational risks associated with digital payment innovations.

Notably, the examined empirical evidence consistently demonstrates that higher solvency and capital adequacy improve bank stability by strengthening banks' capacity to absorb unexpected losses, reducing insolvency risk, and enhancing resilience against financial and macroeconomic shocks. However, most existing studies rely on conventional solvency indicators such as the Capital Adequacy Ratio (CAR), Common Equity Tier 1 (CET1), leverage ratio, or the Z-score. Consequently, empirical evidence on the effectiveness of the Relative Solvency Ratio (RSR) as a measure of bank solvency and financial stability remains scarce. This gap provides a strong justification for the present study, which evaluates whether the Relative Solvency Ratio offers additional explanatory power in assessing the financial health and stability of Deposit Money Banks in Nigeria.

METHODOLOGY

This study adopts the ex-post facto research design to investigate the financial statements of 13 selected Deposit Money Banks in Nigeria for the period 2017-2021. Data were sourced from the financial statements of the studied banks for the indicated study period, and the data collected were deposited at the Zenodo management research data repository (https://doi.org/10.5281/zenodo.21302619) to facilitate independent replication of this research. The completeness of data and homogeneity of operating regulation and standards were the basis for the selection of the banks and the period of study used. The data collected were analytically estimated using the ValuStats (VSP) Statistical Package (version 2.0) and tested for inferential significance at the 95% confidence level.

Methodological Framework

Four existing discriminant and distress prediction tools (Altman Z-score, Springate's Z-score, Taffler's Z-score, and Zmijewski's Z-score) and a bank specific modified Relative Solvency Ratio (RSR) were used to analyse the solvency and stability status of the banks. The predictions from the five tools were further subjected to panel data regression analysis tests for accuracy, effective comparisons and alignment with solvency monitoring objective. The values computed for WCR, RSR, and Taffler's Z-score were logged to bring them to a common numerical baseline with the other three metrics prior to the analysis. The acceptance of the deductive inferential statistical argument was based on a 95% confidence level or 5% significance.

The values used to represent the banks' adequate capital were computed for each bank and period as the *working (liquidity) required* when the entity has attained its operational break even. The formulas are derived as follows:

Enyi's Relative Solvency Ratio (RSR)

The Enyi's relative solvency ratio was first introduced in Enyi (2008) and later refined for brevity in Enyi (2021). It was initially developed for predicting solvency in non-banking institutions. The version of RSR adapted for banking is derived as follows:

$$OBEP = t / (2p) \qquad (1)$$

$$WCR = tc / (1.04p). \qquad (2)$$

$$RSR = [1.04p((a+b) - (d+l+r))] / tc. \qquad (3)$$

Where,

OBEP = Operational break even point stated in cycles of activities.

WCR = Working Capital Required at OBEP, stated in volume of liquidity.

RSR = Relative Solvency Ratio, stated as the ratio of *available liquidity* to *the required liquidity* (WCR at OBEP).

t = turnover (gross income from all sources).

p = profit before tax

c = total operating costs (**t** – **p**)

a = current assets plus loans and advances.

l = current liabilities

b = cash and other liquid assets held by other banks and institutions.

d = total customers' deposits or bank depositors funds.

r = value of CBN cash reserve ratio (CRR) on customers' deposits; which stands at 22.5% for 2017-2019 and at 27.5% for 2020-2021.

Equation 3 represents the formula for the RSR adapted for the measurement of the solvency status of banking institutions. It is different from that of the non-bank firms given in Enyi (2008, 2021). However, the interpretation remains the same. An RSR of zero indicates a bankrupt and liquidated entity; RSR less than 1, indicates an entity with liquidity problem; while RSR greater than or equal to 1, indicates a financially healthy entity. But for banking entities, the RSR must be way above 1 to take the regulatory requirements for buffer capital, depositors' protection, and Central Banks capital reserve ratios' values into account.

Altman's Z-Score

The Altman Z-Score was developed by Edward I. Altman in 1968 using Multiple Discriminant Analysis (MDA) to predict corporate bankruptcy. It was originally designed for publicly traded manufacturing firms and has since been modified for private firms, non-manufacturing firms, and emerging markets (Altman, 1968; Altman, Iwanicz-Drozdowska, Laitinen, & Suvas, 2017). The formula for the original Z-Score is:

$$Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 1.0X_5 \qquad (4)$$

Where:

X_1 = Working Capital / Total Assets

X_2 = Retained Earnings / Total Assets

X_3 = EBIT / Total Assets

X_4 = Market Value of Equity / Total Liabilities

X_5 = Sales / Total Assets

Altman's Z-Score remains one of the benchmark measures in financial distress research despite the development of newer prediction techniques.

Springate's Z-Score

The Springate Z-Score was developed by Gordon L. V. Springate in 1978 at Simon Fraser University. Using Multiple Discriminant Analysis, Springate refined Altman's approach by selecting four financial ratios that offered high predictive accuracy for business failure (Springate, 1978). The formula is:

$$S = 1.03A + 3.07B + 0.66C + 0.40D \qquad (5)$$

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Where:

A = Working Capital / Total Assets

B = EBIT / Total Assets

C = Earnings Before Taxes / Current Liabilities

D = Sales / Total Assets

Taffler's Z-Score

The Taffler Z-Score was developed by Richard J. Taffler in 1983 as a bankruptcy prediction model specifically suited to UK companies. The model was developed using Multiple Discriminant Analysis and incorporated financial characteristics commonly observed in British firms (Taffler, 1983). The formula is:

$$Z = 3.20X_1 + 12.18X_2 + 2.50X_3 + 10.68X_4. \quad (6)$$

Where:

X_1 = Profit Before Tax / Current Liabilities

X_2 = Current Assets / Total Liabilities

X_3 = Current Liabilities / Total Assets

X_4 = Quick Assets / Daily Operating Expenses

Zmijewski's Z-Score (Probit Model)

The Zmijewski model was introduced by Mark E. Zmijewski in 1984. Unlike Altman, Springate, and Taffler, Zmijewski used a Probit regression model instead of Multiple Discriminant Analysis to estimate the probability of financial distress (Zmijewski, 1984). The formula is:

$$X = -4.3 – 4.5(ROA) + 5.7(Debt\ Ratio) – 0.004(Current\ Ratio) \quad (7)$$

Where:

ROA = Net Income / Total Assets

Debt Ratio = Total Liabilities / Total Assets

Current Ratio = Current Assets / Current Liabilities

Panel Regression Model

The panel data regression model applied was based on the need to address the second research question posed in the introduction section:

$$LogWCR_{it} = Cons_{it} + LogRSR_{it} + AltmanZ_{it} + SpringatesZ_{it} + LogTafZ_{it} + ZmijewskiZ_{it} + \S_{it} \quad (8)$$

Where;

LogWCRi is the logged value of the WCR of bank i.

LogRSR, LogTafZ, AltmanZ, SpringatesZ, and ZmijewskiZ are the computed discriminant values for the five tools.

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RESULTS

Presented below are the results from the panel regression analysis.

To ensure data reliability, the ADF stationarity tests were carried out on the data to determine whether statistical properties of the variables used remain constant over time. The results revealed that LogWCR was non-stationary with ADF = -2.7162, and p-value = 0.0713; LogRSR was stationary with ADF = -4.4158, and p-value = 0.0003; AltmanZ was stationary with ADF = -4.5199; and p-value = 0.0002; SpringateZ was stationary with ADF = -4.5390, and p-value = 0.0002; LogTafZ was stationary with ADF = -4.6397, and p-value = 0.0001, while ZmijewskiZ was stationary with ADF = -3.3503, and p-value = 0.0128.

Table 1: Descriptive Statistics:

	LogRSR	AltmanZ	SpringatesZ	LogTafZ	ZmijewskiZ	LogWCR
count	65.00	65.00	65.00	65.00	65.00	65.00
mean	2.66	0.57	0.46	1.88	0.91	16.15
std	0.70	0.25	0.23	0.39	1.85	0.87
min	0.00	-0.78	-0.87	0.00	-1.59	13.62
25%	2.20	0.51	0.39	1.83	0.40	15.65
50%	2.58	0.59	0.48	1.95	0.64	16.21
75%	2.98	0.69	0.56	2.04	0.75	16.87
max	4.41	1.05	0.93	2.38	10.54	17.35

Source: ValuStats (VSP) Statistical Package (Version 2.0)

Table 2: Correlation Matrix:

	LogRSR	AltmanZ	SpringatesZ	LogTafZ	ZmijewskiZ	LogWCR
LogRSR	1.00	0.50	0.55	0.52	-0.51	0.23
AltmanZ	0.50	1.00	1.00	0.81	-0.67	-0.18
SpringatesZ	0.55	1.00	1.00	0.82	-0.69.	-0.17
LogTafZ	0.52	0.81	0.82	1.00	-0.74	0.13
ZmijewskiZ	-0.51	-0.67	-0.69	-0.74	1.00	-0.08
LogWCR	0.23	-0.18	-0.17	0.13	-0.08	1.00

Source: ValuStats (VSP) Statistical Package (Version 2.0)

PANEL REGRESSION RESULTS

The results of the panel data regression analysis are presented in Tables 3 and 4.

F-test for Poolability: 77.426.   P-value: 0.0000.   Distribution: F(16,43)

Included effects: Entity, Time

Wald Test for Joint Significance: Chi2(1, 59) = 4.726632, p-value = 0.03612

Fixed Effects Serial Correlation Test: Durbin Watson's test: 0.775 **H**ausman Statistics: -0.671 P_Value: 1.0

The dataset is serially and positively correlated and the analysis must proceed with Random Effect panel regression model.

Table 3: PanelOLS Estimation Summary (Fixed Effects)

Dep. Variable:	LogWCR	R-squared:	0.6139
Estimator:	PanelOLS	R-squared (Between):	-0.1538
No. Observations:	65	R-squared (Within):	0.1092
		R-squared (Overall):	-0.1537
Log-likelihood	42.438	Cov. Estimator:	Robust
F-statistic:	13.676.	P-value	0.0000
Entities:	13	Distribution:	F(5,43)
Avg Obs:	5.0000	F-statistic (robust):	6.7909
Min Obs:	5.0000	P-value	0.0001
Max Obs:	5.0000	Distribution:	F(5,43)
Time periods:	5		
Avg Obs:	13.000	Min Obs: 13.000	Max Obs: 13.000

Parameter Estimates

	Parameter	Std. Err.	T-stat	P-value	Lower CI	Upper CI
LogRSR	-0.4956	0.2154	-2.3013	0.0263	-0.9300	-0.0613
AltmanZ	4.5782	3.2582	1.4052	0.1672	-1.9925	11.149
SpringatesZ	-4.8977	3.4393	-1.4240	0.1617	-11.834	2.0383
LogTafZ	-0.0850	0.1831	-0.4640	0.6450	-0.4542	0.2843
ZmijewskiZ	-0.0894	0.0520	-1.7210	0.0924	-0.1942	0.0154

Source: ValuStats (VSP) Statistical Package (Version 2.0)

Table 4: Random Effects OLS Panel Regression Results with Driscoll Kraay Corrections

Dep. Variable:	LogWCR	R-squared:	0.367	Adj. R-squared:	0.313
F-statistic:	6.419	Prob (F-statistic):	0.0000798	Log-Likelihood:	-67.894
No. Observations:	65	AIC:	147.8	BIC:	160.8
Df Residuals:	59	Df Model:	5	Covariance Type:	HAC

	coef	std. err	t	P>|t|	[0.025	0.975]
const	12.7339	1.416	8.990	0.000	9.900	15.568
LogRSR	0.6462	0.305	2.115	0.039	0.035	1.258
AltmanZ	7.0851	7.549	0.939	0.352	-8.020	22.190

SpringatesZ	-11.5453	8.571	-1.347	0.183	-28.695	5.605
LogTafZ	1.5818	0.465	3.405	0.001	0.652	2.511
ZmijewskiZ	-0.0333	0.077	-0.430	0.668	-0.188	0.121

===

Omnibus:	3.802	Durbin-Watson:	0.775
Prob(Omnibus):	0.149	Jarque-Bera (JB):	3.731
Skewness:	-0.554	Prob(JB):	0.155
Kurtosis:	2.613	Cond. No.	398.

===

Source: ValuStats (VSP) Statistical Package (Version 2.0)

Notes:

[1] Standard Errors are heteroscedasticity and autocorrelation robust (HAC) using 1 lags and without small sample correction

INTERPRETATIONS

Based on the panel results output in table 3, the following interpretations apply:

1. **Preliminary Analysis**

The panel dataset consists of 65 observations from 13 banks observed over 5 years. Before estimation, stationarity was examined using the Augmented Dickey-Fuller (ADF) test. The dependent variable (LogWCR) was found to be non-stationary (ADF = –2.716, p = 0.0713), while all explanatory variables (LogRSR, Altman Z-score, Springate Z-score, LogTafZ, and Zmijewski Z-score) were stationary at the 5% significance level.

The descriptive statistics indicate moderate variability among the financial health indicators. Pairwise correlations are generally below the conventional multicollinearity threshold of 0.80, although Altman Z-score and Springate Z-score are almost perfectly correlated ($r \approx 1.00$), suggesting serious multicollinearity between these two variables. This may inflate standard errors and reduce the statistical significance of their coefficients.

2. **Fixed Effects Regression**

The Fixed Effects (FE) model (table 3) explains approximately 61.4% of the variation in the dependent variable ($R^2 = 0.6139$). The robust F-statistic is significant (F = 6.7909, p = 0.0001), indicating that the explanatory variables are jointly significant.

The coefficient estimates indicate that:

LogRSR has a negative and statistically significant effect on LogWCR ($\beta = –0.4956$, p = 0.026). This suggests that, after controlling for entity and time effects, higher Relative Solvency Ratio is associated with lower Working Capital Required.

Altman Z-score has a positive coefficient ($\beta = 4.5782$), but it is not statistically significant (p = 0.167).

Springate Z-score has a negative coefficient ($\beta = –4.8977$), but it is not statistically significant (p = 0.162).

LogTafZ is also statistically insignificant ($\beta = –0.0850$, p = 0.645).

Zmijewski Z-score is negative and only marginally significant at the 10% level ($\beta = –0.0894$, p = 0.092).

Thus, under the Fixed Effects specification, Relative Solvency Ratio (RSR) is the only statistically significant predictor of Working Capital Required.

3. **Poolability Test**

The F-test for poolability is highly significant (F = 77.426, $p < 0.001$), indicating that individual bank effects and time effects exist. Therefore, pooled OLS is inappropriate, and a panel estimator is preferred.

4. **Random Effects Regression**

The Random Effects (RE) model (table 4) yields an overall R^2 of 35.3%. The model is statistically significant (F = 6.447, $p < 0.001$), indicating that the explanatory variables are jointly significant.

The RE model coefficient estimates show that LogRSR has a positive and statistically significant influence on LogWCR ($\beta = 0.6316$, p = 0.006). LogTafZ also has a positive and significant effect ($\beta = 1.5817$, p = 0.001). However, Altman Z-score, Springate Z-score, and Zmijewski Z-score are statistically insignificant. Unlike the Fixed Effects model, the Random Effects model suggests that improvements in Relative Solvency Ratio and Taffler's Z-score significantly improve Working Capital Required.

5. **Hausman Test**

The Hausman specification test produced a statistic of –0.671 with p = 1.000, leading to failure to reject the null hypothesis. Therefore, the Random Effects model is preferred because there is no statistically significant difference between the FE and RE estimators.

6. **Serial Correlation**

The Durbin-Watson statistic is approximately 0.775, indicating strong positive serial correlation in the residuals. A Durbin-Watson value substantially below 2 typically indicates positive autocorrelation. Consequently, the ordinary Random Effects standard errors may be unreliable, though the autocorrelation resulted from the use of two similar analytical metrics of Altman’s Z-score and Springate’s Z-score both of which were found to be statistically significant.

7. **Driscoll-Kraay (DK) Robust Results**

Because serial correlation is present, the Driscoll-Kraay heteroskedasticity- and autocorrelation-consistent estimator provides the most reliable inference; used in table 4 to correct the RE defects.

After applying the Driscoll Kraay correction to the Random Effects model, LogRSR remains positive and statistically significant ($\beta = 0.6462$, p = 0.039). Also, LogTafZ remains positive and highly significant ($\beta = 1.5818$, p = 0.001), while Altman Z-score, Springate Z-score, and Zmijewski Z-score remain statistically insignificant. The persistence of the first two significant variables after the DK robust correction strengthens confidence in their effects.

Specifically, the empirical evidence indicates that the Hausman test supports the Random Effects model as the preferred estimator and because residual serial correlation exists, the Driscoll-Kraay robust estimates was reported as the primary results. The results further suggests that Relative Solvency Ratio (RSR) is a robust and statistically significant determinant of Working Capital Required (Capital Adequacy) for Deposit Money Banks under the Nigerian banking regulatory atmosphere. Taffler's Z-score also exerts a significant positive influence on Working Capital Required.

However, the results indicate that Altman's Z-score, Springate's Z-score, and Zmijewski's Z-score do not exhibit statistically significant independent effects after controlling for the other financial health indicators. The near-perfect correlation between Altman and Springate Z-scores suggests multicollinearity, which likely contributed to their lack of statistical significance despite their theoretical relevance.

Thee Driscoll-Kraay Random Effects results was chosen as the main test model in this study because the Hausman test favors the Random Effects specification, and notably because serial correlation is present (DW ≈ 0.775), and especially because Driscoll-Kraay standard errors provide more reliable inference under autocorrelation and heteroskedasticity.

DISCUSSION

The primary objective of this study was to evaluate the effectiveness of Enyi's Relative Solvency Ratio (RSR) alongside four widely used financial distress prediction models (Altman's, Springate's, Taffler's, and Zmijewski's Z-scores) in assessing the solvency and financial stability of selected Nigerian Deposit Money Banks. To test the preliminary suitability for dependent variable and its predictors, the ADF stationarity test results returned constant stationary status for all the five predictors due to formula application consistency, while that of the outcome variable (LogWCR) returned *non-stationary* because individual banks maintain non-identical financial stability levels with other banks at both the short and long terms (see figures 1 and 2). The empirical evidence adduced in the course of this study demonstrates that the Relative Solvency Ratio provides stronger explanatory power for banking stability than the traditional corporate distress prediction models.

Additional insights from the perusal of figures 1 and 2 strongly suggest that the bank with the lowest level of financial stability within the study period was Jaiz Bank Plc., at a little over 14 LogWCR while the banks with the highest stability level during the period are Access Holdings Plc., FBN Holdings Plc , UBA, and Zenith bank.

The Hausman specification test indicated that the Random Effects model was the appropriate estimator, while the presence of positive serial correlation necessitated the use of Driscoll-Kraay heteroskedasticity- and autocorrelation-consistent standard errors. Consequently, the Driscoll-Kraay Random Effects estimates provide the most reliable basis for interpretation. Under this specification, the Relative Solvency Ratio remained positive and statistically significant, indicating that improvements in banks' liquidity relative to their operational liquidity requirements are associated with stronger working capital adequacy. This finding supports the theoretical proposition underlying the Relative Solvency Ratio that bank stability depends not merely on the absolute amount of capital held, but on whether available liquidity is sufficient relative to the liquidity required to sustain operations at the operational break-even point.

The statistical significance of the RSR also validates the proposition advanced by Enyi (2008, 2021) that relative solvency constitutes an effective early-warning indicator of institutional financial resilience. Unlike conventional solvency ratios that measure capital against total assets or liabilities, the RSR explicitly incorporates the liquidity demands imposed by the scale and complexity of banking operations. This operational perspective appears particularly suitable for banking institutions where liquidity management is inseparable from solvency maintenance.

Among the conventional discriminant models, only Taffler's Z-score exhibited a statistically significant positive relationship with the working capital requirement after robust correction. This finding suggests that Taffler's emphasis on liquidity and short-term financial obligations makes it relatively more applicable to banking institutions than Altman's, Springate's, or Zmijewski's models, all of which were originally developed using non-financial corporations. Moreover, the seeming similarity between the RSR and Taffler's Z-score results could be attributed to Taffler's recognition of the importance of Profit Before Tax and the Daily Operating Expenses which featured prominently in RSR formulation. Banks possess unique balance-sheet structures characterized by high leverage, maturity transformation, regulatory capital requirements, and deposit-based funding, making the direct application of manufacturing-based distress models less appropriate.

Altman's Z-score, Springate's Z-score, and Zmijewski's Z-score did not exhibit statistically significant independent effects after controlling for the other explanatory variables. The near-perfect correlation observed between Altman's and Springate's Z-scores suggests severe multicollinearity arising from their reliance on similar financial ratios. Their lack of statistical significance therefore appears to reflect redundancy rather than complete ineffectiveness. Nevertheless, the findings indicate that these traditional distress models contribute relatively little additional explanatory power once banking-specific solvency measures are introduced into the analysis.

The results also have important regulatory implications. Since banking supervision increasingly emphasizes early intervention and continuous monitoring under the Basel III framework, an operational liquidity-based measure such as the Relative Solvency Ratio could complement existing regulatory indicators such as the Capital Adequacy Ratio, Liquidity Coverage Ratio, and Net Stable Funding Ratio. Because the RSR links available liquidity directly to operational requirements, it may provide regulators and bank management with earlier warning signals of deteriorating financial resilience before conventional capital measures become critical.

Comparatively, the results obtained from the empirical analysis of the data used are in complete agreement with the findings of previous researchers on the need to maintain a buffer of operating capital suitable to ward off all threats and dangers inherent in the banking system.

In its own contribution, Mustafa (2024) employing a panel regression with Z-score metrics reported in consonance with the findings of this study that bank stability is enhanced by stronger capital adequacy. Employing similar methodology, Sugestin and Khoiruddin (2025) echoed the same conclusion. Aniemeke (2024) using OLS Time Series regression with Z-score measurement found that regulatory capital and asset quality influence bank stability significantly and like the RSR, laid great emphasis on the maintenance of adequate solvency but was unable to show how such adequate solvency should be measured.

Lastly, Msigwa, et al. 2025, established a strong link between bank stability and all three capital measures of Common Equity Tier 1 (CET1), Total Capital Ratio, and Leverage Ratios. Onyenagubom and Nongu (2024)'s findings on the other hand dwelt more on the significance of the influence of Capital-to-Total Assets on bank stability which reflects a total alignment of the findings with the findings and rationale of this study. The major divergence between the relative solvency technique advanced in this paper with those of the reviewed empirical studies came by way of tools and variables used.

Overall, the findings support the argument that banking stability is better assessed using industry-specific solvency measures than by relying exclusively on generic corporate bankruptcy prediction models. The evidence therefore contributes to the growing literature advocating the development of specialized financial health indicators tailored to regulate financial institutions.

CONCLUSION

This study assessed the relative effectiveness of Enyi's Relative Solvency Ratio and four established financial distress prediction models in evaluating the financial stability of thirteen Nigerian Deposit Money Banks between 2017 and 2021. Using panel regression techniques with appropriate robustness corrections, the study demonstrated that the Relative Solvency Ratio consistently outperformed the conventional distress prediction models in explaining variations in banks' working capital requirements, a proxy for capital adequacy and financial resilience.

The findings establish that the Relative Solvency Ratio is a statistically reliable and operationally meaningful indicator of bank solvency within the Nigerian banking environment. Taffler's Z-score also exhibited significant explanatory ability, whereas Altman's, Springate's, and Zmijewski's models did not retain statistical significance after controlling for panel effects, serial correlation, and heteroskedasticity. These results reinforce the view that bankruptcy prediction models originally designed for non-financial firms have limited applicability to banking institutions because of the distinctive nature of bank balance sheets, regulatory requirements, and liquidity management practices. In addition, the Working Capital Required model introduced in this study introduced a new, simpler and more effective method of computing capital adequacy in line with a bank's earning capacity and without the need to wait for changes in the regulatory requirements.

The study therefore concludes that operational liquidity-based solvency measures provide a more realistic assessment of banking stability than traditional accounting-based distress prediction models. Incorporating the Relative Solvency Ratio into routine supervisory monitoring could strengthen early-warning systems, improve regulatory surveillance, and enhance banks' internal risk management frameworks.

From a policy perspective, regulators, bank executives, investors, and financial analysts should complement existing Basel III prudential indicators with operational solvency measures such as the Relative Solvency Ratio. Such an integrated approach would improve the identification of emerging financial vulnerabilities and support proactive intervention before solvency problems develop into systemic banking crises.

Future research may extend this analysis by applying the Relative Solvency Ratio to larger international samples, comparing its predictive performance across different banking systems, and integrating macroeconomic variables and machine-learning techniques to develop more comprehensive bank stability prediction models.

DECLARATIONS

Ethical Approval and Consent to Participate

This research did not involve any human or animal subjects. The study exclusively utilized published financial statements of the studied entities. According to the Babcock University Research and Ethics Committee (BUREC) guidelines, research using exclusive publicly available documents is exempt from ethical scrutiny that applies to studies involving direct contact with humans or animals.

Authors' contributions

The first author (EPE) conceived the study idea, developed the main model, wrote the manuscript, supervised the data collection and analysis processes, and interpreted the results. The second author (EON) proofread the manuscript and contributed to the sourcing of literature review materials, while the third author (DAO) provided the software used and was responsible for the data analysis.

Consent for Publication

No personalized details, images, or videos of any individuals were used in the preparation of this document. All information provided in the study is available in public domain.

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Data Availability

The data used for the analyses in this study are available for replicative research use at Zenodo management research data repository (Enyi, 2026).

Conflict of Interest

The authors have no conflict of interest to declare.

Declaration of Generative AI and AI-assisted Technologies

This study has not used any generative AI tools or technologies in the preparation of this manuscript.

REFERENCES

1. Allen, F., & Gale, D. (2007). Understanding Financial Crises. Oxford University Press.
2. Altman, E. I. (1968). Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. The Journal of Finance, 23(4), 589-609. https://doi.org/10.1111/j.1540-6261.1968.tb00843.x
3. Altman, E. I., Iwanicz-Drozdowska, M., Laitinen, E. K., & Suvas, A. (2017). Financial distress prediction in an international context: A review and empirical analysis of Altman's Z-score model. Journal of International Financial Management & Accounting, 28(2), 131-171. https://doi.org/10.1111/jifm.12053
4. Aniemeke, E. H. (2024). Determinants of bank stability in Nigeria. American Journal of Economics and Business Innovation, 3(2), 85–93. https://doi.org/10.54536/ajebi.v3i2.2675
5. Basel Committee on Banking Supervision. (2011). Basel III: A Global Regulatory Framework for More Resilient Banks and Banking Systems.
6. Basel Committee on Banking Supervision. (2011). Global systemically important banks: Assessment methodology and the additional loss absorbency requirement. Bank for International Settlements.
7. Basel Committee on Banking Supervision. (2017). Basel III: Finalising post-crisis reforms. Bank for International Settlements.
8. Brownbridge, M. (1998). The causes of financial distress in local banks in Africa and implications for prudential policy. UNCTAD Discussion Papers.
9. Caprio, G., & Klingebiel, D. (2003). Episodes of systemic and borderline financial crises. World Bank.
10. Cole, R. A., & Gunther, J. W. (1998). Predicting bank failures: A comparison of on- and off-site monitoring systems. Journal of Financial Services Research, 13(2), 103–117. DOI:10.1023/A:1007977414686
11. Cook, L. D. (2016). Were the Nigerian banking reforms of 2005 a success … and for the poor? In African Successes, Volume III: Modernization and Development. University of Chicago Press.
12. Demirgüç-Kunt, A., & Detragiache, E. (1998). The determinants of banking crises in developing and developed countries. IMF Staff Papers, 45(1), 81–109. DOI: 10.2307/3867330
13. Dafe, F. (2020). Nigeria: Catch 22: Navigating Basel standards in Nigeria's fragile banking sector. In The Political Economy of Bank Regulation in Developing Countries. Oxford University Press.
14. Diamond, D. W. (1984). Financial intermediation and delegated monitoring. Review of Economic Studies, 51(3), 393–414. https://doi.org/10.2307/2297430
15. Enyi, E. (2026). Relative Solvency and Bank Stability (Version 1) [Dataset]. Zenodo. https://doi.org/10.5281/zenodo.21302619
16. Enyi, P. E. (2021). Corporate survival monitoring mechanism and discriminant analysis using operational break even point and relative solvency ratio. *Academia Letters*, Article 4186. DOI: 10.20935/AL4186
17. Enyi, P. E. (2008). A comparative analysis of the effectiveness of three solvency management models. *SSRN Electronic Journal*. DOI: 10.2139/ssrn.1138357
18. Ibeabuchi, S. N. (2008). Overview of financial sector developments in Nigeria. CBN Economic and Financial Review, 46(4), 13–40.
19. International Monetary Fund. (2019). Global Financial Stability Report. Washington, DC: IMF.
20. International Monetary Fund. (2004). Banking in Sub-Saharan Africa. IMF Working Paper.
21. International Monetary Fund. (2013). Nigeria: Financial Sector Stability Assessment.
22. Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. Journal of Financial Economics, 3(4), 305–360. https://doi.org/10.1016/0304-405X(76)90026-X
23. Klein, M. A. (1971). A theory of the banking firm. Journal of Money, Credit and Banking, 3(2), 205–218. https://doi.org/10.2307/1991279
24. Laeven, L., & Valencia, F. (2020). Systemic Banking Crises Database II. IMF Economic Review, 68(2), 307–361. DOI:10.1057/s41308-020-00107-3
25. Milne, A., & Whalley, A. E. (2001). Bank capital regulation and incentives for risk-taking. Cass Business School Research Paper. (This paper develops the capital buffer framework widely applied in subsequent banking literature.)
26. Mlachila, M., et al. (2013). Banking stability determinants in Africa. International Journal of Managerial Finance, 14(4), 462–483.

27. Monti, M. (1972). Deposit, credit and interest rate determination under alternative bank objectives. In G. P. Szegö & K. Shell (Eds.), Mathematical Methods in Investment and Finance (pp. 431–454). North-Holland
28. Msigwa, E., Gabriel, B. W., & Kohi, A. T. (2025). Capital adequacy and bank stability in developing financial systems: Cross-country evidence during the Basel III implementation phase, 2016–2024. The Accountancy and Business Review. https://doi.org/10.59645/abr.v18i1.755
29. Mustafa, J. A. (2024). From innovation to stability: Evaluating the ripple influence of digital payment systems and capital adequacy ratio on a bank's Z-score. Banks and Bank Systems, 19(3), 67–79. https://doi.org/10.21511/BBS.19(3).2024.07
30. Ojo, M. O. (1991). Deregulation in the Nigerian banking industry: A review and appraisal. CBN Economic and Financial Review, 29(1), 1–14.
31. Onyenagubom, C., & Nongu, A. M. (2024). Capital adequacy and bank stability in Nigeria: A panel ARDL approach of selected listed Deposit Money Banks in Nigeria. International Journal of Banking, Finance and Research, 10(4), 1–24. https://doi.org/10.56201/ijbfr.v10.no4.2024.pg1.24
32. Reinhart, C. M., & Rogoff, K. S. (2009). This Time Is Different: Eight Centuries of Financial Folly. Princeton University Press.
33. Schinasi, G. J. (2004). Defining Financial Stability. IMF Working Paper WP/04/187.
34. Simpasa, A., Gurara, D., & Nandwa, B. (2011). African financial systems: A review. Review of Development Finance, 1(2), 79–113.
35. Springate, G. L. V. (1978). Predicting the possibility of failure in a Canadian firm (Unpublished MBA Research Project). Simon Fraser University, Canada.
36. Sugestin, F. F., & Khoiruddin, A. Y. (2025). The effect of liquidity, profitability, and capital adequacy on the financial stability of Islamic commercial banks in Indonesia for the 2021–2024 period. Journal of Islamic Banking: Student Insight. https://doi.org/10.14421/v58wnr89
37. Taffler, R. J. (1983). The assessment of company solvency and performance using a statistical model. Accounting and Business Research, 13(52), 295-308. https://doi.org/10.1080/00014788.1983.9729767
38. Zmijewski, M. E. (1984). Methodological issues related to the estimation of financial distress prediction models. Journal of Accounting Research, 22(Supplement), 59-82. https://doi.org/10.2307/2490859

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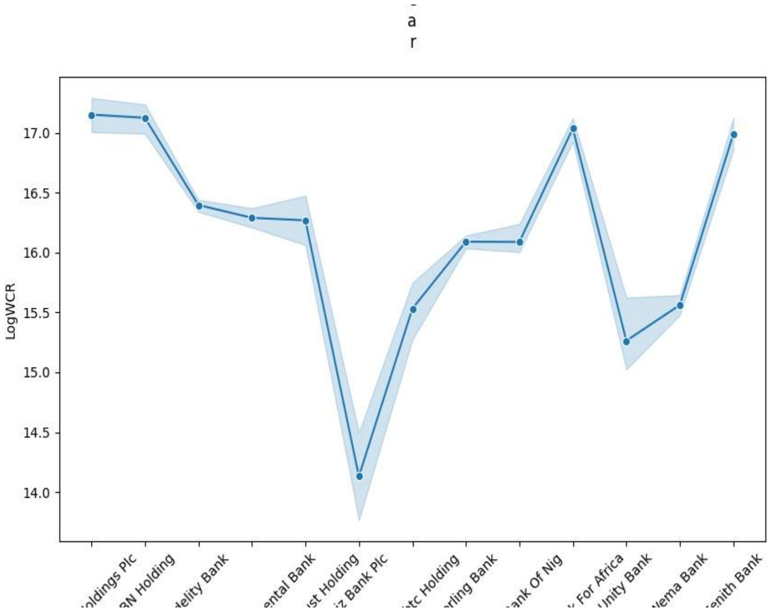
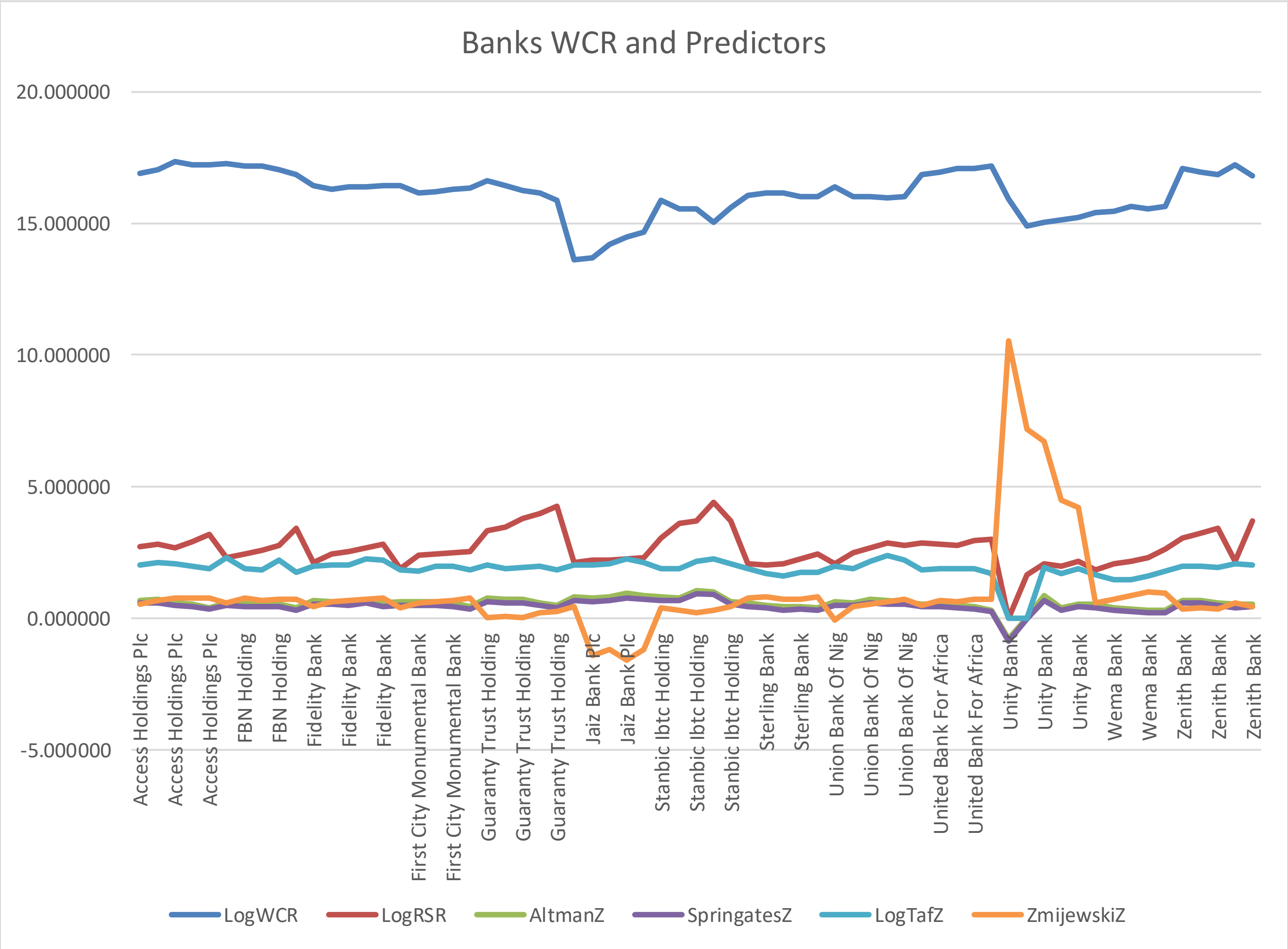
APPENDIX

Figure 1: Predicted Bank Stability Trend Line (2017-2021)



Source: ValuStats (VSP) Version 2 (2026)

Figure 2. Outcome and Predictors Comparative Curves



Source: Researchers analysis with Microsoft Excel (2026)